TECHNOLOGY DEVELOPMENT DATA SHEET



Field-Usable Portable Analyzer for Chlorinated Organic Compounds



Developer: Transducer Research, Inc. Contract Number: DE-AC21-92MC29118

Crosscutting Area: CMST



Problem:

Widespread use of chlorinated solvents such carbon as tetrachloride, trichloroethylene, and perchloroethylene has resulted in contamination problems in the air, soil, and ground water at many DOE sites. Characterizing the extent of chlorinated hydrocarbon contamination. controlling remediation treatment processes, and monitoring of regulatory compliance frequently require hundreds or thousands of analyses. Traditional sampling and off-site laboratory analysis methods are expensive and do not provide the immediate results needed for health and safety protection and effective process control. Currently available field-usable, portable monitoring systems do not specifically measure for chlorinated hydrocarbons at the low concentrations and precision needed. Current field monitoring systems have not demonstrated reliability or ease of use by field technicians.

Solution:

A fully portable, hand-held, solidstate-sensor-based monitoring system that measures low

of chlorinated concentrations organic compounds has been developed and is available for field demonstration. The system is capable of detecting chlorinated hydrocarbons in the range of 0.2-25 ppm and up to 500 ppm with an internal dilution feature that is incorporated into the instrument. The portable analyzer can be used to analyze samples from start-up in less than 15 minutes or in a continuous monitoring mode in 10 minutes or less. The system is designed for field use by technicians wearing protective clothing and for easy maintenance. The instrument can be operated from an AC line or from an internal battery.

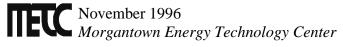


Benefits:

- Selective detection of chlorinated organics in mixture with other hydrocarbons
- ► Reduced analytical costs through screening to reduce the number of samples requiring laboratory analysis
- Nearly immediate results and low limits of detection enhance applications for worker health and safety monitoring, process monitoring, or initial characterization of spills and historical releases
- ▶Portable, hand-held (twelve pounds total weight), and can be operated by technicians with minimal training

Technology:

Current field usable portable systems have not proven reliable in selectively detecting chlorinated hydrocarbons in the 1-2ppm range required for certain DOE applications. Recent solid-state sensor developments provide the required durability, sensitivity, and selectivity that allowed the design of





Printed on Recycled Paper

a portable instrument for detection of chlorinated hydrocarbons in the vapor phase.

The sensor developed for this instrument relies on increased conductivity when heated and exposed to hydrogen chloride (HCl) chlorinated hydrocarbon and compounds. Examples of common chlorinated hydrocarbons detected include carbon tetrachloride, trichloroethylene and tetrachloroethylene. The sensor used in this instrument is not responsive to nonchlorinated hydrocarbons, oxygenated compounds, or nitrogenated compounds. The sensor responds to chlorinated organics even when nonchlorinated organics, such as motor fuels and waste oils, are Many field instruments present. selectively distinguish cannot chlorinated between and nonchlorinated compounds.

To extend the lifetime of the sensor, an analytic duty cycle was custom-programmed to have a short exposure time coupled with a long recovery time. Generally the chemical analyses are performed in a 90 second period followed by a 5 to 10 minute zeroing time to allow sensor recovery. Through the addition of a diluter interface,

life is extended sensor by restricting sensor exposure to a predetermined concentration level. prototype instrument developed and is currently being used at Hanford for health and monitoring, remediation safety process monitoring, and site characterization. Based on user feedback, the developer of the instrument has simplified operation of the instrument, improving sensor reliability and reducing the time needed for calibration and instrument setup.

Development of a condensed phase sampler for the instrument to enable detection of chlorinated hydrocarbons in water and sludges is continuing. A range of 5.0 to 10,000 ppb of carbon tetrachloride contamination in water has been obtained using prototype equipment.

Contacts:

Transducer Research, Inc. (TRI) is a mid-size research and development firm. TRI has significant instrument design and manufacturing capabilities through its parent, TSI, Inc. For information on this project, the contractor contact is: Principal Investigator: William J. Buttner Transducer Research, Inc. 600 N. Commons Drive, Suite 117 Aurora, IL 60504 Phone: (708) 978-8802

Fax: (708) 978-8854

E-mail:wbuttner@interaccess.com

DOE's Morgantown Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

DOE Project Manager: Rodney A. Geisbrecht Morgantown Energy Technology Center 3610 Collins Ferry Road

Morgantown, WV 26507-8880

Phone: (304) 285-4658 Fax: (304) 285-4403

E-mail: rgeisb@metc.doe.gov

